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EXPLORING THE THERAPEUTIC POTENTIAL OF KEY MEDICINAL PLANTS IN INDIAN TRADITIONAL MEDICINE: A COMPREHENSIVE REVIEW

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ABSTRACT
The varied qualities of three medicinally significant plants were compared in this comprehensive review, especially Morinda tinctoria, Psidium guajava, and Acalypha indica, in the context of Indian traditional medical systems, includes Homeopathy, Siddha, Unani, and Ayurveda. With assessments mostly focused on their phytochemical and pharmacological qualities, these medicinal plants have been important sources of healing in these systems. The study incorporates the rich tradition of Indian traditional medicine, which emphasizes the use of many plant components, including leaves, fruits, latex, vegetative buds, aerial roots, stem bark, and bark from stems and roots. This tradition has used Morinda tinctoria, Psidium guajava, and Acalypha indica to treat ailments like dysentery, diabetes, diarrhea, and different urino-genital system diseases. Besides their traditional uses, these plants have also been researched for their hepatoprotective, antitumor, antidiabetic, antihypertensive, analgesic, anti-inflammatory, and antibacterial effects. This review combines historical and recent knowledge about these species, stressing the potential benefits for modern medicine. With the help of this comparative analysis, we hope to close the knowledge gap between traditional wisdom and modern science, promoting additional study and fostering a better comprehension of the therapeutic potential of Morinda tinctoria, Psidium guajava, and Acalypha indica within the broader framework of Indian traditional medicine.

Keywords: *Medicinal plants, traditional medicine, Morinda tinctoria, Psidium guajava, Acalypha indica, phytochemicals, pharmacological properties.*

INTRODUCTION
Traditional medicine is a comprehensive healing system that has been used for over 5,000 years in India. One of the oldest medical systems in existence, Ayurveda has its roots in the ancient Indian texts known as the Vedas. To advance general wellbeing, it emphasizes striking a balance between the body, mind, and soul. Ayurveda is important for a variety of reasons. It emphasizes the value of customized treatments and gives a distinctive perspective on health and wellness. Every person is different, so their health requirements should be catered to appropriately, according to Ayurveda. Ayurveda also uses organic treatments made from herbs, minerals, and other plant-based sources. When compared to contemporary medications, these treatments are frequently less intrusive and have fewer adverse effects. The focus on natural healing is in line with the rising interest in complementary and alternative medicine around the world. The promotion of a healthy lifestyle by Ayurveda is another important part of the system. It offers suggestions for eating right, working out, meditating, and practicing yoga to keep your body and mind in balance. This all-encompassing strategy can aid in sickness prevention and the advancement of general wellbeing. Indian traditional medicine also has cultural relevance. It is fundamental to the history and identity of the nation and reflects the rich past of India. It remains an object of pride and a representation of India's contributions to world healthcare. Ayurveda has seen resurgence in popularity in recent years, both in India and beyond. In search of more all-encompassing and organic methods to improve their health, people are turning more and more to traditional medical systems like Ayurveda. As a result, the influence of Ayurveda transcends the boundaries of India and contributes to the global conversation about holistic healthcare and the union of conventional and modern medical systems.

In the context of Indian traditional medicine, this review's comparative study will focus on the three medicinal plants *Morinda tinctoria, Psidium guajava, and Acalypha indica*. This comparative study attempts to assess and compare the therapeutic uses, historical applications, phytochemical composition, and medicinal characteristics of these plants in Ayurveda and other Indian traditional medical systems. This review aims to provide insights into the distinctive contributions of each plant to Indian traditional medicine by exploring their similarities and variances. This will help readers gain a better knowledge of their functions in promoting health and wellbeing under this antiquated healing paradigm.

Historical Context
Throughout the history of human civilization, the use of plants in medicine has been a fundamental aspect of cultural and traditional practices. Even in the absence of modern scientific advancements, plants have played a

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pivotal role in treating a wide array of diseases. The knowledge of plant-based treatments was traditionally passed down through generations via word of mouth and folklore, shaping the evolution of human healthcare.

In contemporary times, this ancient wisdom is still preserved, particularly among tribal communities, where herbs and plants remain a primary source of medicine. This practice, known as ethnobotany and ethnopharmacology, entails the transmission of knowledge regarding the uses of medicinal plants. To document and safeguard this valuable folklore knowledge, extensive surveys, review articles, and source documentation are essential. [1]

In the context of your comparative review, the focus is placed on the Indian mulberry plant, *Morinda tinctoria.* This plant, also known as Indian mulberry, holds a significant place in classical medicine. It's been applied for various treatment objectives based on ethnobotanical and ethnopharmacological knowledge, with numerous research endeavors exploring its potential benefits across the globe.

Additionally, guava plants (*Psidium guajava)* have found unique applications in different countries for treating various ailments. The various parts of the guava plant, including the leaves, roots, bark, stem, and fruits, have been harnessed to address a spectrum of health issues.[2]

Notably, Asian countries have harnessed guava leaves to develop traditional medicines, particularly for diabetes management. Guava leaves possess multifaceted properties, including antiamoebic, antispasmodic, antidiarrheal, anti-inflammatory, antihypertensive, antiobesity, and antidiabetic attributes. [3]

Acalypha indica, a common weed, also contributes significantly to the rich tapestry of traditional medicine in India. With its extensive usage in Ayurveda and across various states, it has been employed to address an array of health concerns. Its leaves, roots, and other plant parts have been transformed into remedies for cough, earaches, headaches, ulcers, constipation, arthritis, pneumonia, and various skin conditions. The plant's versatility is evident in its various preparations, including juice, paste, decoctions, infusions, sap, and powders, all employed to combat different. [4]

Plant Review - *Morinda tinctoria.*

Naming and Nomenclature

Morinda tinctoria is a member of the Rubiaceae family. There are numerous names for the plant. It is referred to as Maddichettu in Telugu, Acchhi in Hindi, Achuka in Sanskrit, Nunna in Tamil, Tagetemara in Kannada, Kadappilavoo in Malayalam, and Baratindiala in Marathi. The plant, which is native to South India as indicated by its name, it is widespread throughout the plateau's arid and semiarid regions. The English name for it is the Indian mulberry plant.

Taxonomy

Kingdom: Plantae

Phylum: Angiosperms

Class: Eudicots

Order: Gentianales

Family: Rubiaceae

Genus: Morinda

Species: Morinda tinctoria

Habitat

Morinda tinctoria. thrives in a variety of habitats. It is typically found in tropical and subtropical regions, often in coastal areas, and can grow in both dry and moist conditions, including forests, open fields, and near water bodies.

Traditional Properties

The entire plant is advantageous and has a long history of use, as was already mentioned. In the past, the leaves have been used to cure diarrhoea, ulcers, and dyspepsia. Basically, the leaves are supposed to be used for indigestion and stomatitis as well as other gastrointestinal issues. They can also be used as an emmenagogue and general tonic. The external application of the leaves' juice, which has remarkable wound healing properties, is used to treat wounds. Additionally, it is used to treat fevers with no known cause. Wounds and inflammation are treated with roots. To treat boils, the paste is administered to the skin. Fruits can be used ripe or unripe to

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ward against diarrhea and amoebic dysentery. There are allegations that the fruits are burnt to ash and incinerated. Additionally, this ash is utilized to control cholera and vomiting. [5]

Phytochemical Properties

Morinda tinctoria, is renowned for its rich phytochemical properties. It is a treasure trove of bioactive compounds such as anthraquinones, flavonoids, tannins, alkaloids, saponins, and phenolic compounds. Among its notable constituents, anthraquinones stand out for their potential medicinal significance, exhibiting antimicrobial, anti-inflammatory, and antioxidant properties. Flavonoids and phenolic compounds contribute to its antioxidant capabilities, aiding in the neutralization of harmful free radicals. These phytochemicals collectively underscore the therapeutic potential of *Morinda tinctoria*, making it a subject of interest for various health applications in traditional and modern medicine.

Pharmacological Properties

Antiulcer Activity

Research was made to see if plant leaves had any ulcer-preventing properties. After the leaves were extracted for their ethanol extract, the ulcers in the rats were studied using the pylorus ligation model and the cysteamine-induced ulcer model. Both models had their ulcer parameters examined after the extract was taken orally. By modifying the protective components, the extracts demonstrated antiulcer action and aided in cytoprotection. [6]

Antibacterial Property

Several solvent extracts of the plant's leaves were used to investigate the antibacterial effectiveness of the extract. The plant's antibacterial activity was demonstrated by this outcome. The phytochemistry of the plant was also investigated, and FTIR was used to pinpoint several constituents such quinones, steroids, terpenoids, and glycosides. Esters, carboxylic acids, and alkenes were present in the ethanol extract of the leaves.[7]

Antioxidant Activity

In order to look into the antioxidant activity of the plant, the leaves of the Morinda were extracted using chloroform, n-hexane, ethyl acetate, and methanol. Also evaluated was the leaves' overall phenolic content. Oleuropein and cynarin were extracted from extracts of methanol and chloroform, respectively, and their antioxidant activity was assessed using the DPPH method. The extract's activity ranged from 91% in hexane extract, which was the greatest, to 65% in ethyl acetate extract, which was the lowest. [8]

DPPH free radical scavenging and the H_2O_2 methods were used to examine the extracts' antioxidant properties. An ethanol extract of the plant's leaves was utilized to assess its activity, and the results revealed an 85% suppression of free radicals and a capacity for almost 8% total antioxidants. In the H_2O_2 technique, the extract demonstrated 78% of the activity. [7]

Anti-Inflammatory Activity

By measuring the protease activity and protein degradation, ethanol extract of Morinda leaves has been examined to demonstrate its anti-inflammatory potential. The extract significantly reduced cell lysis by over 70%, with findings showing 44% protein degradation and 45% protease activity. The ethanol extract of the leaves thus shown anti-inflammatory effects.[7]

Wound Healing Activity

In a study, the topical application of 20 and 10 mg/ml concentrations of the Morinda fruit's chloroform extract to rats examined for the potential of the extract to promote the healing of wounds. In comparison to groups that weren't treated, the full healing of the wound was observed in just 15 days. [9]

Another study looked into the Morinda leaf aqueous extract's capacity to heal wounds in Wistar rats. The rate of wound healing was determined by timing the wound contraction and epithelialization processes after directly applying the extracts to the lesion. The results suggested that because the extracts have superior wound-healing qualities, they could be used in wound-healing ointments.[10]

Antidiabetic Activity

Morinda tinctoria has been investigated for its potential to regulate blood sugar levels. Some studies suggest that it may have antidiabetic properties by influencing glucose metabolism and enhancing insulin sensitivity.

Antihypertensive Activity

There is evidence to suggest that *Morinda tinctoria* may have a role in lowering blood pressure. Its bioactive compounds may contribute to vasodilation and help manage hypertension.

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Pharmacognostic Study
The aim of the study was to identify the pharmacognostic characteristics of the Morinda plant, including ash values, LOD, phytochemical analysis, and fluorescence analysis. It revealed that aqueous and methanol extracts included alkaloids, tannins, and polyphenols. Paper chromatography was used to examine the fresh leaves for the presence of the amino acids glycine, proline, phenylalanine, and valine. [11]

Phytochemistry
The following chemicals have been identified from the plant after phytochemistry analysis of the leaves. Quercetin, Kaempferol, Acacetin, and Ursolic acid are examples of flavonoids that have been identified. [12] Iron, copper, manganese, and zinc, at amounts of 20, 79, 5, and 10 ppm, have been detected in leaves. [13]

In addition to the chemical morindone glycoside, the plant's stem included numerous other chemical components. From the plant's heartwood, the anthraquinone ester tinctomorone, damnacanthal, and nordamnacanthal were isolated. [14]

The plant's fruits were examined and isolated for lowering lipids and carbohydrates. Fruits are the best food sources for manganese, calcium, and potassium. The abundance of fiber in the fruits was also highlighted.[15]

Plant Review - *Psidium guajava.*

Naming and nomenclature
Psidium guajava, the common guava tree, is known locally in South India by names such "Perakkaai" in Tamil, "Jaamapandu" in Telugu, and "Perakka" in Malayalam, which indicate its popularity in the area and cultural importance. This well-liked fruit tree is referred to scientifically using the binomial system, in which "Psidium" stands for the genus and "guajava" for the species. The use of this scientific nomenclature is widespread throughout the world. With its fragrant fruits and varied culinary uses, guava maintains a unique place in South Indians' hearts and kitchens as a source of nourishment, flavor, and folk medicines. South India, where the tree grows and is still revered, gains from its regional names and scientific categorization.

Taxonomy

Kingdom: Plantae

Phylum: Angiosperms

Class: Eudicots

Order: Myrtales

Family: Myrtaceae

Genus: Psidium

Species: *Psidium guajava*

Habitat
It is an adaptable tropical plant that prefers warm, humid climates as its habitat. It flourishes in a range of environments, including semi-arid places, lowland areas, and tropical rain forests. Guava trees can grow in a variety of soil types and are well-suited to tropical and subtropical climates. They can grow wild in disturbed places but are frequently cultivated in orchards and backyard gardens. Although the species is indigenous to Central America, it has been introduced and naturalized in numerous tropical and subtropical areas all over the world, making it a widespread and common plant.

Traditional Properties
Psidium guajava is a valuable food crop and medicinal plant used to treat a number of illnesses in tropical and subtropical countries. Traditional Chinese medicine use guava formulations to treat ailments like diabetes, cancer, cardiovascular disease, and parasite infections. The metabolites of the plant, such as phenol, flavonoid, carotenoid, terpenoid, and triterpene, have advantageous biological effects. *Psidium guajava*'s leaves and fruits have anti-inflammatory, anti-allergy, antibacterial, antispasmodic, cardioactive, anti-diabetic, antioxidant, and hepatoprotective qualities. Diabetes mellitus is treated with traditional Chinese medicine in China. Flavonoids are found in the leaves of *Psidium guajava*, and higher flavonoid molecules like glycoside and aglycone have the highest antioxidant capabilities. [16]

Phytochemical Properties
Guava, a tropical fruit tree, has been traditionally used for its potential health benefits. Some of the main bioactive substances include terpineol, a terpenoid alcohol with anti-inflammatory and antioxidant effects, beta-

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caryophyllene, a sesquiterpene with analgesic and anti-inflammatory effects, rutin, α-humulene, oleanolic acid, quercetin, flavonoids, tannins, lectins, ellagic acid, amritoside, beta-sitosterol, and uvaol, oleanolic, and ursolic acids. These compounds have been studied for their potential health benefits, and consuming guava as part of a balanced diet can contribute to overall health and well-being.

Terpineol is a terpenoid alcohol with anti-inflammatory and antioxidant effects, while beta-caryophyllene modulates cannabinoid receptors, making it useful for anxiety disorders and pain control. Rutin, a flavonoid with antioxidant properties, supports blood vessel health and reduces the risk of cardiovascular diseases. α-humulene has anti-inflammatory and analgesic effects, and oleanolic acid may protect the liver and support skin health. Quercetin, a flavonoid with antioxidant and anti-inflammatory properties, may support cardiovascular health. [17]

Pharmacological Properties

Antibacterial Activity
The essential oil from guava leaves was tested for its ability to kill bacteria. Fresh leaves were hydro distilled to obtain the volatile oil. The MIC (minimum inhibitory concentrations) of the antibacterial activity were calculated using the broth microdilution method in 96-well microplates. Oral pathogens such Streptococcus mitis, S. salivarius, S. mutans, S. sanguinis, and S. sobrinus are moderately susceptible to the essential oil. Essential oils from *Psidium guajava* have detrimental impacts on maintaining ionic equilibrium, cell pH, and cell membrane integrity. [18]

Anticancer Activity
The anticancer potential of several compounds extracted from *Psidium guajava L*. leaves has been studied. Cell viability studies revealed that compounds inhibited the growth of human colon cancer cells (HCT116) in a dose-dependent way. Using flow cytometry, the potency of the drugs was evaluated. These substances played a role in regulating the levels of expression of crucial proteins involved in cell growth and apoptotic signals. This causes cancer cells to undergo cellular death. Three bioactive chemicals from leaf extract that exhibit noteworthy actions against human colon cancer cells have been discovered by researchers. As a result, this plant can be utilized to prevent colon cancer with chemotherapy.[19]

Antidiabetic Activity
Psidium guajava L. ethanolic leaf and bark extracts have been reported to have antidiabetic properties. The extract's ability to inhibit yeast and porcine -glucosidase has been established. Using 2-deoxy-D-(1-3 H)-glucose, glucose absorption by skeletal muscle cells (murine C2C12) was evaluated. It was determined whether rat hepatoma H4IIE liver cells had glucose-6- phosphatase activity and whether adipocyte-like cells had triglyceride buildup. The lactate dehydrogenase cytotoxicity assay was used to establish the maximum non-toxic doses of guava leaf extracts. Guava bark extract dramatically reduces the activity of amylase. The adipocytes' triglyceride content is increased by the bark and leaf extract, which also results in better glucose uptake by muscle cells. The study proved that guava plant extract can be used as a natural source for lowering -glucosidase and -amylase activity. [20]

Antidiarrhoeal Activity
Psidium guajava L.'s alcoholic leaf extract showed anti-diarrheal efficacy in a rat model of diarrhea caused by Escherichia coli. We evaluated the stool's water content, Escherichia coli density, behavioral, and blood characteristics. Different biochemical assessments were performed on the tissues of the treated animals (small intestine, colon). The findings show a considerable restoration of the impaired antioxidant level as well as pro-inflammatory cytokine expression. These findings demonstrated the potent anti-diarrheal properties of guava leaf extract. [21]

Anti-Inflammatory Activity
It has been proven that freeze-dried guava leaf aqueous extract contains anti-inflammatory properties. The anti-inflammatory function was discovered by employing in-vitro models, such as the inhibition of heat-induced denaturation of egg albumin and bovine serum albumin (which is a measure of the activity). The inhibitory activity of the aqueous extract is compared to that of the control drug. As a result, it became clear that guava leaf extract possessed strong anti-inflammatory qualities.[22]

Antioxidant and Antimutagenic Activity
Methanol, ethyl acetate, ethanol, benzene, and petroleum ether extracts from Psidium guajava leaves displayed antimutagenic and antioxidant activities. The antioxidant activity of the extracts was assessed utilizing the DPPH free radical scavenging, Fe3 + reducing power, and cupric ions (Cu2+) reducing ability assays. It is

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contrasted with common medications (ascorbic acid, butylated hydroxytoluene). The tester strains (Ames Salmonella) were used to test the extracts for antimutagenic activity against sodium azide, methyl methane sulfonate, and 2-aminofluorene. According to the findings, the methanolic extract displayed the highest level of antioxidant activity and prevented mutagenicity by more than 70%. It's possible that guava's high phenol content is what gives it its antimutagenic and antioxidant properties. [23]

Hepatoprotective Activity

Psidium guajava's aqueous leaf extract has hepatoprotective properties against the hepatotoxicity caused by aluminum. Its chemical actions (raising the antioxidant response by activating a nuclear transcription factor) are what cause the hepatoprotective effect. By deactivating Nuclear Factor kappa B (NF-B), which lessens cellular stress and preserves mitochondrial activity, the extract also lessens the inflammatory response. [24]

Ulceroprotective Activity

Alcohol-induced stomach ulcers in adult Wistar rats has been shown to be ulceroprotective by guava leaf extract in methanol. A dose-dependent reduction in ulcer indicators is caused by the extract. Coenzyme Q10 and quercetin, two antioxidants found in guava, are important in shielding cells from oxidative damage brought on by reactive oxygen species. The high antioxidant activity of quercetin appears to be the cause of its action. In addition to inhibiting cyclooxygenase, lipoxygenase, and xanthine oxidase, quercetin scavenges oxygen-free radicals. Additionally, it blocks the activity of histamine and prostaglandins, two inflammatory mediators. [25]

Anthelmintic Activity

Butanolic extract of *Psidium guajava* leaves has been tested for its anthelmintic effect on adult Indian earthworms (Pherithima posthuma) and compared to piperazine citrate. The results show that the guava butanolic extract outperforms the widely used drug piperazine citrate. All tested dosages of the extract cause the Pherithima posthuma worms to become paralysed, which is followed by death. The rate at which the worms were paralysed or killed was inversely correlated with the efficacy of the guava extract. The researchers therefore *supported Psidium Guajava*'s anthelmintic properties. [26]

Antihypertensive Activity

A methanolic extract of the fruit and leaves of Psidium guajava has been found to have antihypertensive effects. The researchers looked at Psidium guajava's ability to block the ACE (angiotensin I converting enzyme). The findings showed that all guava preparations significantly decreased angiotensin I converting enzyme (ACE) activity. The extract's capacity to inhibit ACE was related to its total phenol and flavonoid content. Phenolic compounds show a structure-function relationship in their ability to inhibit ACE by chelating the zinc ion active site or by promoting the development of hydrogen bridges between the active site of phenols and the amino acid residues. A concentration-dependent inhibition of the ACE is caused by the extract. As a result, it is determined that one of the potential reasons for guava's antihypertensive effect is the suppression of ACE. [27]

Antifungal Activity

The antifungal efficacy of guava leaf extracts in aqueous and hydroethanolic forms was examined in this study. By subculturing on solid media, the MFC (minimum fungicidal concentration) was determined. The cell viability curve had been used to show how different fungus strains (Candida tropicalis, Candida albicans) were inhibited from growing. The extracts also have an impact on the ability to transition morphologically and prevent the production of hyphae and pseudo hyphae. This outcome demonstrated the extract's fungistatic properties. [28]

Pharmacognostic Study

Psidium guajava is the subject of a thorough physical, chemical, and biological analysis as part of the pharmacognostic investigation. The evaluation of the plant's macroscopic characteristics, such as its distinctive leaves, bark, and fruits, as well as its microscopic components, such as leaf stomata and trichomes, are included in this study. Chemical analyses help to identify and measure the numerous phytochemicals, including flavonoids, phenolic compounds, and anthraquinones, that are present in guava and contribute to its therapeutic effects. Pharmacognostic research also aims to confirm the plant's veracity, purity, and quality, guaranteeing its compatibility for both conventional and contemporary medical uses while abiding by set norms and rules.[29]

Phytochemistry

Psidium guajava has a variety of bioactive substances. Flavonoids with antioxidant qualities as quercetin, myricetin, and kaempferol are included in its phytochemical composition. Additionally, guava includes phenolic substances with possible health advantages including gallic acid and ellagic acid. Alkaloids and tannins are found in the leaves, which contribute to their therapeutic qualities. Guava fruits are also recognized for having high vitamin C concentrations, which increases their antioxidant ability even further. Together, these

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phytochemicals make guava a beneficial food choice with possible health benefits, such as antioxidant and anti-inflammatory actions, making it a topic of attention in both conventional and modern medicine. [30]

Plant Review - *Acalypha indica.*

Naming and Nomenclature

Acalypha indica, also referred to as "Kuppaimeni" in Tamil and "Khokali" in Hindi, is a key component of traditional medicine in South India and all of India. With regional names that reflect its local awareness, its nomenclature underlines its significance as an indigenous species. *Acalypha indica*, the plant's binomial nomenclature, emphasizes its species identity within the Acalypha genus. This versatile herb's precise identification is guaranteed by its botanical nomenclature. It has long been prized in the Indian subcontinent for its wide range of medical benefits and conventional therapeutic uses. [31]

Taxonomy

Kingdom: Plantae

Phylum: Angiosperms

Class: Eudicots

Order: Malpighiales

Family: Euphorbiaceae

Genus: Acalypha

Species: *Acalypha indica*

Habitat

It is a versatile and hardy plant that thrives in a wide range of habitats. It is a common sight across many tropical and subtropical regions, including parts of Asia, Africa, and the Americas. Acalypha indica exhibits adaptability to various environmental conditions, often found in disturbed areas, along roadsides, in fields, and near settlements. It can grow as both a weed and a cultivated herb in gardens. This plant is known for its resilience and ability to thrive in diverse ecosystems, making it a readily available and accessible resource for traditional herbal medicine in many regions.

Traditional Properties

Acalypha indica, a common plant, has been used for ages to treat a variety of human ailments. Only a few nations still utilize it in the conventional manners: India, Western Nepal, Bangladesh, Mozambique, North Djibouti, Seychelles, Réunion, East Africa, Namibia, Mauritius, Mozambique, Indonesia, Ethiopia, Northern Transvaal, Sri Lanka, and Southern Thailand. Juice made from the plant's leaves is used to cure a variety of ailments, including scabies, rheumatoid arthritis, pneumonia, earaches, constipation, and syphilitic ulcers. The entire plant's juice is used to treat bronchitis, pneumonia, snake bites, and flatulence. The leaves are ground into a paste and used to treat a variety of conditions, including wounds, burns, itching, chest pain, and dermatological issues. While the entire plant paste is used to treat diuretic, constipation, skin issues, and severe coughs, the root paste is utilized to treat fungal infections.

In India, the plant's parts are blended with those of other plants to cure a wide range of ailments, such as wounds, parasites, dog bites, dermatitis, and wound healing. The plant's leaves and roots have been used to treat rheumatism, cholesterol, and other illnesses as well as diarrhea. [4]

Phytochemical Properties

Methanolic extract comprises phenolic, flavonoid, alkaloid, tannin, steroid, terpenoids, and saponin components for the complete Acalypha indica plant, whereas diethyl ether, ethyl acetate, and ethanolic extracts contain alkaloid, flavonoid, phenolic, and saponin components. In one experiment, tannins, steroids, amino acids, and oils were found in the ethyl acetate fraction of the aqueous alcoholic extract, while saponins, flavonoids, and amino acids were found in the methanolic fraction. Reducing sugar, coumarin, anthocyanin, anthraquinone, saponin, cardiac glycoside, terpenoid, tannin, alkaloid, flavonoid, and phenolic compounds are among the substances found in leaves. Sterols are also present in leaves and can be extracted using petroleum ether and chloroform. Root extracts in methanol and water underwent screening to detect the saponin, alkaloid, terpenoid, phenolic, and flavonoids. [33]

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Pharmacological Properties

Post-Coital Anti-Fertility Activity
Female albino rats are used to investigate the post-coital antifertility effects of four sequential solvent extracts of *Acalypha indica*, including chloroform, ethanol, petroleum ether, and water. Oil ether and ethanol extracts at (600 mg/kg body weight) shown estrogenic action among them. The extracts in aqueous and chloroform do not have estrogenic action. [34]

Anti-Venom Properties
The neutralization of Viper russelli (Russell's viper) venom by an *Acalypha indica* leaf extract was tested on rats and isolated frog tissue. The results showed that, at dosages of 500 and 750 mg/kg, ethanol leaf extract inhibited Viper russelli venom-induced mortality, haemorrhaging, necrotizing, and mast cell degranulation in rats as well as the cardiotoxic and neurotoxic effects on isolated frog tissue. Additionally, the extract decreased GSH and catalase levels in rat kidney tissue and prevented RBC lipid peroxidation brought on by venom.[35]

Wound Healing Effect
The potential of ethanolic extracts of Heliotropium indicum, Plumbago zeylanicum, and *Acalypha indica* to hasten the healing of wounds in rats was investigated using excision and incision wound models following tropical administration. The findings demonstrated that 10% weight/volume Acalypha indica extracts generated with saline had a poorer collagen maturation rate and wound healing activity when compared to Heliotropium indicum. [36]

Effect of Acalypha Indica On Malarial Vector
Anopheles stephensi, the malarial vector, was tested against different leaf extracts from *Acalypha indica* for larvicidal, ovicidal, and oviposition attractancy (benzene, chloroform, ethyl acetate, and methanol). The results demonstrated that extracts are effective at killing larvae, with respective LC50 values of 19, 25, 27, 76, 23, and 15. The percent hatchability for ovicidal effect is inversely related to the extract concentration and directly proportional to the eggs. The benzene extract had the highest oviposition effective attractancy (90.09 percent), followed by chloroform (94.20 percent), ethyl acetate (85.43 percent), and methanol extract (95.75 percent).[37]

Antioxidant Capacity
The antioxidant activity of the aqueous ethanolic leaf extracts of the following plants was examined: Becium dhofarense, Pulicaria crispa, Allophylus rubifolius, Olea europaea, Acacia senegal, Pluchea arabica, Anogeissus dhofarica, Moringa peregrina, Cordia perrottettii, Ficus lutea, and *Acalypha indica*. The findings demonstrated that after 15 minutes of incubation at a test concentration of 50 g/ml, all extracts had anti-oxidant activity in the DPPH method at 89-93 percent.[38]

Anti-Inflammatory Activity
In four groups of albino rats that had gone without food the night before, the fresh juice of *Acalypha indica* leaves was tested for its ability to reduce inflammation. One hour prior to the injection of carrageenan, all four groups of six animals are pretreated orally with control, standard (Indomethacin), *Acalypha indica*, and a combination of *Acalypha indica* and indomethacin. Rats' righthand paws were given a 0.1 ml injection of a 1 percent carrageenan solution to cause acute oedema. A plethysmometer was used to measure the paw volume 0–4 hours after injection. The findings showed that *Acalypha indica* leaf juice was an efficient inhibitor of paw volume and oedema.[39]

Acaricidal Activity
Acalypha indica leaf paste's in vitro acaricidal ability was examined for 48 hours, and the results showed that the maximal inhibition was seen with the suppression of lesions after 48 hours. On the basis of the live mite count and lesion score in naturally infected broiler rabbits, the in vivo acaricidal property of *Acalypha indica* leaves was investigated for 14 days. The findings showed that after 4 hours of treatment, the paste made from *Acalypha indica* leaves killed living mites.[40]

Diuretic Activity
In albino mice, the methanolic extract of *Acalypha indica* was tested for its diuretic properties. When compared to the reference medicine frusemide at the dose of 20mg/kg body weight, the results showed that *Acalypha indica* showed maximum diuretic effect at the dose of 400 mg/kg body weight after five hours of administration.[41]

Antibacterial and Antifungal Activities
The study examined the antibacterial effects of extracts from *Acalypha indica*'s leaves, stem, and roots in ethyl acetate, hexane, and methanol against Bacillus subtilis, Staphylococcus aureus, and Klebsiella pneumoniae. The

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results showed promising inhibition of all three bacterial species, while extracts from hexane showed moderate activity. Aeromonas hydrophilla and Bacillus cerues showed the greatest levels of inhibition. The active ingredient in root, leaf, and stem extracts was more effective than other extracts in controlling Candida albicans, Aspergillus niger, and Escherichia coli.[42]

Pharmacognostic Study

Acalypha indica is a medicinal plant that has been studied for its pharmacognostic, phytochemical, and biochemical properties. The study involved organoleptic, fluorescence, preliminary phytochemical, and biochemical analyses. The results of the study revealed the presence of biologically active compounds in *Acalypha indica*. The organoleptic study provided a scientific basis for the traditional use of *Acalypha indica*. The variation in color and taste were observed. Fluorescence analysis gave different colors of powders and treatment with chemicals exhibited changes in reactivity of powders. [32]

Phytochemistry

Traditional uses for the medicinal plant *Acalypha indica* include the treatment of rheumatism, stomach ulcers, snake bites, liver/kidney issues, and microbiological infections. It contains phenols, flavonoids, tannins, coumarins, alkaloids and their glycosides, saponins, volatiles, and fatty acids, according to phytochemical research. *Acalypha indica*'s traditional and pharmacological properties are due to these phytoconstituents. *Acalypha indica* extracts have been demonstrated in scientific tests to be effective in treating cancer, inflammation, heart damage, diabetes, tuberculosis, and malaria1. The mechanism of action, pharmacokinetics, and active phytochemicals of *Acalypha indica* extracts still require further study.[4]

Table 1 - Comparative Profile of Medicinal Plant Properties

Characteristics	*Morinda tinctoria*	*Psidium guajava*	*Acalypha indica*
Naming and Nomenclature	Commonly known as "Indian Mulberry"	Commonly known as "Guava"	Commonly known as "Kuppaimeni" (Tamil) and "Khokali" (Hindi)
Taxonomy	- Kingdom: Plantae - Phylum: Angiosperms - Class: Eudicots - Order: Gentianales - Family: Rubiaceae - Genus: Morinda - Species: Morinda tinctoria	- Kingdom: Plantae - Phylum: Angiosperms - Class: Eudicots - Order: Myrtales - Family: Myrtaceae - Genus: Psidium - Species: Psidium guajava	- Kingdom: Plantae - Phylum: Angiosperms - Class: Eudicots - Order: Malpighiales - Family: Euphorbiaceae - Genus: Acalypha - Species: Acalypha indica
Habitat	Indigenous to India and Sri Lanka, found in various habitats including dry forests and hilly regions	Native to Central America but naturalized in many tropical and subtropical regions worldwide, thrives in warm, humid climates	Thrives in tropical and subtropical regions, grows in diverse habitats, from disturbed areas to gardens and fields
Traditional Properties	Used traditionally for dyeing, wound healing, and as a medicinal plant, known for its antimicrobial and anti-inflammatory properties	Significant food crop and medicinal plant in tropical and subtropical regions, used for various ailments including diabetes, cardiovascular disease, and diarrhea	Key component of traditional medicine in South India, used for diverse conditions such as scabies, rheumatoid arthritis, and wound healing
Phytochemical Properties	Rich in bioactive compounds including anthraquinones for dyeing, anti-inflammatory agents, and antimicrobial constituents	Contains terpenoids, flavonoids, and antioxidants, offers potential health benefits including antidiabetic, anticancer, and hepatoprotective properties	Contains phenolic, flavonoid, alkaloid, tannin, terpenoid, and saponin compounds, contributing to its pharmacological qualities
Pharmacological Properties	- Wound healing activity - Antimicrobial and anti-inflammatory effects - Antioxidant and hepatoprotective properties	- Antibacterial and antifungal activity - Anticancer potential - Antidiabetic effects - Anti-inflammatory and antioxidant properties	- Post-coital antifertility activity - Anti-venom properties - Diuretic and wound healing activity - Antioxidant capacity - Anti-inflammatory, acaricidal, and antibacterial/antifungal activities
Pharmacognostic Study	- Examined for dye extraction - Rich in anthraquinones -	- Extensive studies on phytochemistry - Rich in terpenoids, flavonoids, and	- Subject of a pharmacognostic study - Presence of biologically active compounds confirmed

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	Organoleptic and biochemical characteristics studied	phenolic compounds	
Phytochemistry	Rich in anthraquinones for dyeing, and bioactive compounds responsible for its pharmacological properties	Contains terpenoids, flavonoids, phenolic compounds, and antioxidants, contributing to its diverse health benefits	Contains phenols, flavonoids, tannins, alkaloids, saponins, and more, supporting its traditional and pharmacological use
Major Bioactive Compounds	- Morindone and morindine for dyeing - Terpenoids and anthraquinones - Anti-inflammatory constituents	- Terpineol, beta-caryophyllene, rutin, and quercetin - Flavonoids and phenolic compounds - Antioxidants	- Phenolic and flavonoid compounds - Alkaloids and saponins - Phytochemicals responsible for various pharmacological activities
Principal Pharmacological Effects	- Wound healing - Antimicrobial and anti-inflammatory properties - Antioxidant and hepatoprotective effects	- Antibacterial and antifungal activity - Anticancer and antidiabetic effects - Anti-inflammatory and antioxidant properties	- Post-coital antifertility activity - Anti-venom properties - Diuretic and wound healing activity - Antioxidant capacity - Anti-inflammatory, acaricidal, and antibacterial/antifungal activities

CONCLUSION

The comparative analysis of three exceptional plants—*Morinda tinctoria, Psidium guajava,* and *Acalypha indica*—has examined their various therapeutic characteristics. These native to different areas of the world have received a lot of attention in both traditional and modern medicine because of their abundance in phytochemicals and therapeutic potential. The Indian mulberry, *Morinda tinctoria,* has a variety of bioactive substances, such as anthraquinones and flavonoids, which support its antiulcer, antibacterial, antioxidant, anti-inflammatory, and wound-healing properties. The plant has potential for therapeutic uses in the treatment of gastrointestinal problems, microbial infections, and wounds. The common guava tree, *Psidium guajava,* is well known for its abundance of antioxidant phytochemicals, such as flavonoids, terpenoids, and phenolic compounds. Diabetes, cancer, cardiovascular disease, and anti-diarrheal properties are among its traditional uses. The guava's numerous benefits could help prevent chronic illnesses and enhance wellbeing in general. The widely used medicinal herb *Acalypha indica* includes a variety of biologically active substances, including phenols, flavonoids, alkaloids, and tannins. It has demonstrated a range of pharmacological qualities, including acaricidal, antibacterial, antifungal, anti-venom, wound healing, diuretic, and anti-inflammatory effects. Its widespread traditional use shows that it is useful in treating a variety of health problems. These three plants, which come from various geographical locations, represent nature's extensive therapeutic supply. They act as sources of beneficial phytochemicals that have the ability to address a variety of health issues. By bridging the gap between conventional wisdom and modern science in the goal of better healthcare, further study into these substances active ingredients and mechanisms of action may reveal more therapeutic benefits.

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